

## ORIGINAL ARTICLES

### SURGICAL MANAGEMENT OF CARCINOMA OF THE COLON\*

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ONE may not with authority dogmatize the surgical treatment of carcinoma of the intraperitoneal portion of the large bowel, and at the same time maintain a legitimate mortality rate in his work and favor the patient with the greatest prospect of cure. There is no field of surgery in which individualization is more important; individualization not only of the patient, but of the surgeon as well. Under certain circumstances a particular surgical procedure may be executed by one surgeon with reasonable safety while the same procedure in the hands of another would be extremely hazardous. I know whereof I speak, because I have failed where another might have succeeded.

Many factors are concerned not only in the curability of carcinoma of the intraperitoneal colon, but in the selection of the surgical procedures that may be executed with reasonable safety in the various situations in which neoplastic disease of the large bowel is encountered. So far as curability of these lesions is concerned, if one may ever justly use the term in malignant disease, the stage of advancement of the lesion at the time of its recognition is perhaps most important.

#### THE DIAGNOSIS

One may hardly discuss the surgical management of carcinoma of the colon without at least brief reference to the problems of diagnosis of this lesion in the various situations in the large bowel. So far as early symptoms are concerned, they may be spoken of as being generally bizarre and characterized by insidious change of bowel habit or function which, it must be emphasized, is not peculiar to neoplastic disease of the colon. Except in childhood and in young adults any change in bowel function should not be lightly dismissed without sufficient investigation to at least exclude neoplastic disease. It has been said many times that obstruction may be the first sign or symptom of carcinoma of the colon. I should like to emphasize the fact that obstruction is never an early symptom of this disease. Disturbance of bowel habit, as increasing constipation or intermittent loose stools, practically always antedates neoplastic obstruction of the colon. It should be carried in mind that usually the lesion must progress to complete or almost complete circumferential annularity before obstruction can occur. In other words, complete obstruction is indicative not of early but usually of advanced neoplastic disease, even though not necessarily indicative of an inoperable lesion. It is worthy of note that approximately 54 per cent of the neoplastic lesions of the intraperitoneal colon occur in the rectosigmoid, sigmoid and descending colon, where

many of them may be encountered on digital, bimanual or abdominal palpation, and where many of them can be proctoscopically visualized. I speak of this to emphasize the fact that the diagnosis may be made or at least suspected by simple means in the hands of all men and women in medicine. So far as the sigmoid flexure and other situations in the colon in which carcinoma occurs are concerned, the competent roentgenologist has established a high degree of diagnostic accuracy through visualization of irregularities in outline and filling defects in the course of or following the barium enema. When one wishes to appraise the reliability of roentgen examination of the colon, one should remain mindful that some limitations must be placed upon the roentgenologist's interpretation of his findings in the rectosigmoid; for this segment has been referred to by Dr. K. S. Davis as the "roentgenologic no man's land."

#### OPERABILITY

In each case there are a number of matters which must be ascertained in order that one may determine intelligently and accurately the operability of the lesion and the probability of its cure. First of all it is important to determine whether or not the lesion is mobile or fixed and, if fixed and immobile, whether the fixation is due to extrinsic invasion of the lesion or to extrinsic inflammatory reaction. Some idea of the mobility of a palpable lesion often may be obtained through physical examination. In other instances the roentgenologist may determine mobility through palpatory manipulation under fluoroscopic control, as the filling defect is visualized to him in the course of the barium enema. Fixation of the lesion may be a serious matter and even though fixation of the lesion is demonstrated on physical examination or on fluoroscopic visualization, the nature of that fixation can usually be determined only through abdominal exploration. It is worthy of note that fixation does not necessarily denote inoperability, for in many instances that fixation is the result of the inflammatory reaction of protective perforation, and not infrequently under such circumstances the lesion can successfully be extirpated. On the other hand when fixation of the lesion is the result of extrinsic invasion of the growth to retroperitoneal structures, the futility of surgical extirpation has been rather firmly established. It should be emphasized that fixation of a lesion is not an early but rather a late manifestation of neoplastic disease of the large bowel which directs attention to the relationship of early diagnosis, or diagnosis of early disease, to the operability and curability of these lesions.

A second matter which needs to be ascertained in the operability and curability of a malignant lesion of the colon is that of intraperitoneal metastases. In general it may be stated that the operability and prognosis of these lesions depend not only upon the degree of local extension of the disease and the mobility of the lesion, but on the extent of lymphatic metastases, if present, and whether or not blood-borne metastases, particularly to the liver, have occurred. Printy, Jamieson and

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Dodson, have conclusively shown that a chain of lymphatics accompanies the blood vessels to the colon, and that the pattern of the lymphatic system corresponds closely with the vascular pattern composed of the right and middle colic arteries, and the inferior mesenteric artery and their various branches and ramifications. In the course of an abdominal exploration, the matter of lymphatic glandular involvement usually can be accurately ascertained. Regional glandular involvement, when grossly confined to the main lymphatic chain adjacent to the segment of colon in which the lesion is situated, does not in itself constitute inoperability if the lesion is mobile and when there are no remote metastases discernible, even though such regional glandular involvement materially reduces the percentage prospect of the curability of the disease. The extensiveness of the glandular involvement is important, and certainly a more favorable prognosis may be anticipated when only one or two nodes are involved than when the entire chain which accompanies the vascular pattern is involved in the lymphatic metastatic extension. In my experience regional glandular involvement in varying degrees has been present in approximately one-third of the cases in which radical extirpation of the lesion has been accomplished, with little variation in the incidence of such glandular involvement for lesions in the various situations in the intraperitoneal colon. Although the incidence of glandular involvement has shown little variation in the various segments of the colon, the results in terms of patients living five years after resection without recurrence are approximately 10 per cent better for lesions of the right half of the colon than for those of the left half. The degree of malignancy of the primary lesion is an important factor in prognosis; and while considerable variation in the degree of malignancy exists in lesions in the right and left half of the colon, it is the relative incidence of the grade II lesions of Broder's classification which accounts for much of the more favorable prognosis in lesions of the right colon. Rankin has credited the right half of the colon with 57.6 per cent five-year survivals following radical extirpation of operable carcinoma, and the left half of the colon with 47.7 per cent five-year survivals. It has become a well established fact that the prognosis following radical extirpation of lesions of the colon is best when the growth is situated in the proximal colon and gradually becomes less favorable in each descending segment of the colon from the cecum to and including the rectum.

Inoperability of carcinoma of the intraperitoneal colon is manifested in advanced disease most frequently by invasion of retroperitoneal structures and fixation, metastases to the liver, or generalized metastases to the visceral and parietal peritoneum. In the absence of the clinical manifestations of metastases to the liver, ascites and poor general condition of the patient which preclude operation, operability of an intraperitoneal colonic lesion usually may be determined accurately only through abdominal exploration.

#### PREOPERATIVE TREATMENT

Experience by this time has proved conclusively that the employment of certain measures for a matter of several days preliminary to operation materially enhances the safety of any surgical procedure on the colon. No one today may avoid justifiable censure who hastily undertakes a radical extirpation of a malignant lesion of the colon before adequate preliminary measures have been instituted. It could not happen here, I am sure; yet within the past six weeks I have observed the antemortem state of an individual who sixty hours previously had entered a hospital under his own power, who forty-five minutes later was on the table and was subjected to a resection for an obstructing carcinoma of the sigmoid, on a hastily arrived-at preoperative diagnosis of adhesions. Obstruction of the colon at times provides urgency for remedial measures, but never may one hastily resort to radical surgical extirpation of a highly obstructive carcinoma for purposes of relieving the obstruction, if the best interests of the patient are to be served.

Inanition, anemia and not infrequently obstruction of a variable degree are manifested in many patients who harbor a carcinoma of the colon. Not infrequently the inflammatory reaction in the colon adjacent to the lesion is responsible for a mild febrile state with its concomitant clinical manifestations. Sometimes the localized infection incident to invasion fixation but more frequently the protective perforation of the lesion, with or without abscess formation, adds the problem of sepsis to be dealt with before any radical extirpative procedure may be employed.

It is of the greatest importance that the colon shall be cleansed as thoroughly as possible of all residue before instituting any type of colonic resection. In its accomplishment in the absence of obstruction several days may be employed to advantage preoperatively through the use of mild laxatives, enemas and a low residue diet. The incidence of obstruction of the colon is greater in the left colon than in the right side. Circumferential lesions of the cecum and ascending colon seldom are encountered, while they are common on the left side. It is of interest that circumferential lesions seldom produce obstruction through their own occlusion of the lumen of the colon. Instead, obstruction in the circumferential lesion is nearly always the result of impaction of a dehydrated fecal column against the lesion. The effectiveness of enemas has been demonstrated frequently in relieving this impaction-type of obstruction. Intestinal intubation and decompression through use of the Miller-Abbott tube have been demonstrated repeatedly as effective in relieving left-sided colonic obstruction. It should be carried in mind that a colonic obstruction may be dealt with with greater deliberation than obstruction of the small intestine. When decompression is not accomplished within a few days by nonsurgical means, the indications usually become clear for preliminary cecostomy or colostomy at some distance proximal to the lesion. I should like to repeat that obstruction must be relieved pre-

liminary to radical extirpation of an obstructing carcinoma.

Inanition and dehydration contribute much to the risk of surgical procedures on the colon, and certainly high caloric and vitamin fortification with restoration of body fluids preoperatively are urgently in order before resorting to any surgical procedure of magnitude. The preoperative transfusion of blood where anemia is prominently manifested materially enhances the patient's ability to withstand the operation of extensive resection of the colon for carcinoma.

The use of intraperitoneal vaccine preoperatively has been strongly advocated in certain surgical circles. Its value is a debatable question. It is entirely possible that the principles of immunity are brought to bear by such intraperitoneal vaccination. There seems to be no question but what a degree of immunity *in vivo* is established in many of the cases of carcinoma of the colon in which a protective perforation has occurred, as is evidenced by the relatively slight postoperative febrile reaction which is observed at times following a radical extirpation of such lesions in the presence of infection. On the other hand, as to whether the intraperitoneal introduction of vaccine forty-eight hours previous to colonic resection provides a degree of immunity, remains a matter clouded with considerable doubt. We may be certain that a preoperative introduction of vaccine into the peritoneal cavity does not provide occasion for undue liberties in the execution of the surgical procedures, nor does the use of vaccine compensate for technical errors.

#### SURGICAL PROCEDURES

An important question in the minds of many is that of the type of operation that shall be performed in operable carcinoma of the colon, particularly as to whether the operation shall be performed and completed in one stage or in two or more stages. Those who employ two or more stages in all cases stand on the principle that, through multiple stages, the maximum degree of safety is provided irrespective of the site of the lesion. There are some faults to be found in such a policy, but they are of insufficient moment to dwell upon them here. It may be stated, however, that malignant disease in certain situations in the colon and under certain circumstances may be removed successfully with restoration of intestinal continuity in one stage. Obstruction, protective perforation, marked anemia, generally poor condition of the patient, and senility, irrespective of the site that the lesion occupies in the colon and in every surgeon's hands, constitute for the most part definite indications for a multiple stage operation. It is worthy of emphasis that, whether the resection is performed as a primary or as a secondary operation, it should include as much of the mesentery not only adjacent to the segment of colon resected, but as much of that in which the lymphatics accompany the blood vessels, to insure the widest removal of any possibly involved lymph nodes.

*Lesions of the Right Colon.*—The right colon anatomically lends itself very readily to a one-stage

resection and restoration of intestinal continuity, and in patients in good condition in whom there is an operable mobile lesion of the cecum or ascending colon, the one-stage iliocecostomy and resection of the right half of the colon is preferred by many to the multiple-stage operation. For purposes of wide removal of possibly involved regional lymph nodes, resection of the cecum, ascending colon and the right third of the transverse colon is required in practically all cases of carcinoma of the cecum, the ascending colon and the hepatic flexure. In a number of instances where I have encountered a small lesion of the cecum or ascending colon without regional glandular involvement, I have had permanent cure of the cecal lesion following simple resection of the cecum with end-to-end anastomosis of terminal ileum and ascending colon, and cure of the lesion of the ascending colon through segmental resection and end-to-end anastomosis between the ascending and transverse colon.

The two-stage resection of the right colon is of two types. The usual procedure consists of an ileo transverse colostomy as the first stage, with resection of the right colon at the second stage. The procedure of Lahey embraces resection of the colon as the first stage, and restoration of intestinal continuity as the second stage.

*Malignant Lesions of the Transverse Colon, Splenic Flexure and Descending Colon* present problems in anastomotic procedures which have a distinct bearing on operative risk and mortality rate. They are usually most successfully operated upon by multiple or graded procedures, in the selection of which there is great variation in the sequence of the various steps as pertains, particularly to preliminary cecostomy or colostomy, resection and restoration of intestinal continuity as influenced by many factors. It may be stated that seldom, if ever, may one employ with any degree of safety a one-stage resection and simultaneous restoration of intestinal continuity for lesions in these situations.

*Lesions of the Sigmoid* likewise may seldom, if ever, be operated upon as a one-stage procedure wherein the resection is immediately followed with an end-to-end anastomosis in the absence of a previously made cecostomy or colostomy. It is in mobile lesions in this section of the colon that obstructive resection is employed most advantageously, with or without a previously made cecostomy or colostomy. On many occasions in my experience a cecostomy performed simultaneously with the obstructive type of resection for a carcinoma of the sigmoid has proven a useful safety vent during the post-operative period while clamp obstruction of the sigmoid was maintained. The temporary colostomy at the site of an obstructive resection of the sigmoid can be so fashioned that spontaneous closure occurs in approximately 50 per cent of the cases and thus obviates the necessity for subsequent surgical closure.

*Lesions of the Rectosigmoid* present many problems which are concerned primarily with the difficulties of maintaining or restoring intestinal continuity following resection, which must be weighed in each case against the advantages and disadvan-

tages of a permanent colostomy and abdominoperineal resection in either one or two stages. The selection of the procedures that shall be used in lesions in this situation may be influenced by many factors and only through individualization of the patient may the purposes of the surgical procedures be best served.

In bringing this rather cursory discussion to a conclusion, I should like to repeat that many factors are concerned in the successful treatment of carcinoma of the intraperitoneal colon. Through early recognition of the disease, operability and curability of the disease have been somewhat enhanced during recent years, and through the employment of important preoperative measures and the judicious selection of surgical procedures operable, carcinoma in most segments of the colon can be removed within a reasonable and legitimate mortality rate.

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## GOITER IN NORTHERN CALIFORNIA

A SURVEY OF ONE HUNDRED AND SEVENTY-FIVE  
THYROID OPERATIONS

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**E**NDEMIC goiter is highly prevalent in Northern California where the northern coast ranges join the Sierra Nevada ranges, extending from Del Norte throughout Siskiyou and Modoc counties. Of the one hundred and seventy-five goiter operations which I have performed, 95 per cent were for patients who were born or lived in this area most of their lives.

The average age incidence of those with nodular goiter at the time of operation was forty-five years. They presented moderate to severe heart damage at the time of operation, and most of them were rehabilitated following operation. The average age incidence at the time of operation of those with diffuse toxic goiter was thirty-five years. They gave a history of much shorter duration of the presence of goiter. Their chief symptoms were weight loss, extreme nervousness and cardiac. The cardiac symptoms in the diffuse, toxic group cleared more quickly following operation than the nodular group. Their more rapid rehabilitation following surgery was undoubtedly due to less permanent damage to the vital organs than the nodular group, as we know the toxic manifestations of the nodular type are more insidious, and degeneration of the myocardium is more advanced, while regeneration of heart reserve was more difficult to regain.

### PREOPERATIVE PROCEDURES

A careful history was obtained in all cases and routine general physical examination made. Considerable importance was placed upon the history and personal observation of the patient in arriving at a diagnosis and mode of procedure. Laboratory work, such as blood counts, urinalysis, basal metabolism and electrocardiograph tracings of those with unchecked heart damage was done routinely. Iodin was administered internally to those with diffuse, toxic goiter, and in the case of nodular goiter where

the basal metabolism was plus 15 or above. Bedrest was instituted for a period of time preparatory to surgery, depending on the amount of heart damage and basal metabolic rate. Digitalis was administered to those with heart damage. This treatment was continued until the pulse rate was 100 or below with absolute rest. Little attention was paid to the presence of irregularity of rhythm. Those with high basal metabolic rates received continued treatment until the basal metabolism was perceptibly lowered before surgery was undertaken. A high caloric diet and fluids were administered freely during preoperative care.

### OPERATIVE PROCEDURES

The preoperative preparation and careful handling of the patient were deemed of utmost importance in carrying them through a successful surgical procedure. The judgment of the operator as to the opportune time of operation was considered of utmost importance. Before the patient was deemed ready for operation, a tapwater enema was given each morning, and hypodermically, sterile water, for one or two mornings before surgery. On the morning of surgery, a basal anesthesia was administered rectally for the tapwater enema, and a small dose of morphin was administered hypodermically. The usual sedative was administered routinely as on previous days of hospitalization. The choice of anesthesia was usually between Gwathmy and avertin. The patient was transferred to the operating room in a semiconscious state, and placed upon the operating table in the operating position with the sandbag between the shoulders, the neck in moderate hyperextension. Following the usual skin preparation and draping of the patient, the skin at the site of operation was anesthetized with infiltration of 1 per cent novocain solution. The usual collar incision was made—a straight transverse incision 1 centimeter above the sternal notch and as short as possible. The skin and platysma were dissected to and above the cricoid cartilage. The deep cervical fascia and muscles were then infiltrated with 1 per cent novocain solution. The deep cervical fascia was divided longitudinally directly over the trachea and isthmus of the thyroid. The ribbon muscles separated and rarely divided, their division being done only for better exposure. At this stage of operation, nitrous oxid and oxygen gas were administered.

In the diffuse toxic goiter, sentinel hemostats were placed on the pole to be excised, one at the superior pole, one on the lateral capsule, dividing the lateral vein, and one on the inferior pole which included glandular tissue. The isthmus was then divided by inserting a Kocher dissector from below upwards and upon the trachea. Kelly hemostats were then clamped on both sides and the isthmus divided between them. The Kocher dissector was left in place to avoid injury to the trachea by the hemostats and dissecting knife. In this manner, the trachea was brought into view and maintained in view throughout the rest of the operation. The pole to be excised was then dissected away from the trachea with outward rotation. The operator's left index finger was put beneath the pole and against